PRINTER RUSH

I FW

(PTO ASSISTANCE)

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[RUSH] **MESSAGE:** On page 35 line 27 measurement is missing in front of cm.

Thank you

[XRUSH] **RESPONSE:** corrected

See Attachment

INITIALS: KP

NOTE: This form will be included as part of the official USPTO record, with the Response document coded as XRUSH.

REV 10/04

temporal history of total number density of ground-state atomic Co, determined from integrating the LIL from a complete set of atomic-Co images of the type shown in FIG. 8B.

To understand where and when growth occurred, LEL-ICCD imaging and spectroscopy of the C/Ni/Co plume were performed at different times after laser vaporization, delta t, spanning 20 ns < delta t < 30 ns. For delta t < 0.2 ms, a series of shocks within the plume results in segregation of the ablated material into the vortex ring (or "smoke ring") shown at delta t = 0.2 ms in FIGS. 8A and 8B. This vortex ring is generated because of the viscous interaction between the plume and the background gas, promoting clustering of plume species through three-body collisions. As shown in FIG. 8A, the vortex motion efficiently traps aggregated nanoparticles in a confined volume for long times (approximately 3 sec within approximately 1 cm^2 in this example).

The leading edge of the plume propagates with velocities of: approximately 10^3 cm/s between 200 μs < Δt < 2 ms; 50 cm/s for 10 ms < Δt < 50 ms; and 6 cm/s at 30 ms < Δt < 200 ms. After Δt = 2 s the plume stops moving upstream and the plane of the vortex ring tilts toward the tube axis, possibly due to flow currents or thermophoretic forces. The plume is then dragged by the gas flow back to the collector with an estimated flow velocity of 0.6 cm/s. Finally, nanotubes and unconverted soot deposit on the cool collector 120 surface by thermophoresis. A detailed comparison between the plume dynamics at room temperature and at 1000 °C is described in the following example.

FIGS. 9A-9D depict plasma emission (dashed) and laser-induced luminescence (solid) spectra measured at different time delays after the ablation laser pulse, Δt, and distances, x, from the target: FIG. 9A depicts Δt = 20 μs, x = 0.1 cm. FIG. 9B depicts Δt = 100 μs, x = 0.5 cm. FIG. 9C depicts Δt = 1 ms, x = 2 cm and FIG. 9D depicts Δt =20 ms, x = 5 cm. Acquisition times of 100 ns (FIGS. 9A-9B) and 3.5 μs (FIGS. 9C and 9D) began 50 ns after the XeCl-laser pulse. The inset in FIG. 9C shows a 1.3-nm resolution spectrum of induced fluorescence from the following transitions: (1) $b^4F_{7/2}$-$y^2G^0_{9/2}$ at 341.23 nm

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